

WHAT IS CLAIMED IS:

1. A modular apparatus for performing a process on an object conveyed to and from a location comprising:
  - 5 a pair of frame rails extending on opposite sides of a location and generally parallel to a path of conveyance of an object through the location;  
at least two legs attached to each of said frame rails for elevating said frame rails above a plane of an upper surface of the object at the location;  
at least one cross support member connecting said frame rails together to form a  
10 rigid frame structure with said legs;  
at least one robot arm mounted on an associated one of each of said frame rails, said at least one robot arm being movable along said associated frame rail;  
and  
a tool mounted on each of said at least one robot arms for performing a process  
15 on the object whereby said at least one robot arms move said tools relative to the object enabling said tools to perform processes on the object.
2. The apparatus according to Claim 1 wherein each said at least one robot arm extends to reach said tool mounted thereon to all exteriors surface on one side of the  
20 object.
3. The apparatus according to Claim 1 wherein said at least one robot arms are positioned in opposition to provide symmetric processing to the object.
- 25 4. The apparatus according to Claim 1 wherein each said at least one robot arm includes a process controller mounted for movement therewith along said associated frame rail.
5. The apparatus according to Claim 4 wherein said at least one cross support  
30 member is hollow for receiving cables and conduits connecting said process controllers together.

6. The apparatus according to Claim 4 wherein said at least one cross support member is tubular and purged with an inert gas or air for explosion protection.

7. The apparatus according to Claim 1 wherein each said at least one robot arm includes two axes of motion defining a generally vertical planar operating space of said at least one robot arm.

8. The apparatus according to Claim 7 wherein each said at least one robot arm includes a wrist connected between a free end of said at least one robot arm and said tool, said wrist having two axes of motion.

9. The apparatus according to Claim 1 wherein each said at least one robot arm includes four axes of motion for orienting said tool relative to the object.

10. A modular apparatus for painting exterior surfaces of an object moved along a path comprising:

a pair of frame rails mounted on opposite sides of and extending generally parallel to a path of movement of an object, said frame rails being elevated above a plane of an upper surface of the object as the object travels the path, said frame rails being connected together in a rigid frame structure;

at least one robot arm mounted on an associated one of each of said frame rails, each said at least one robot arm having two axes of motion for movement in a generally vertical plane transverse to the path of movement of the object and being movable along said associated frame rail; and

a paint applicator mounted on each of said at least one robot arms for dispensing paint whereby said at least one robot arms move said paint applicators relative to the object while said paint applicators dispense paint to cover the upper surface and side surfaces of the object with the paint.

11. The apparatus according to Claim 10 wherein each said at least one robot arm includes a wrist mounting said paint applicator, said wrist having a rotating axis and a tilting axis for moving said paint applicator relative to the object.

5           12. The apparatus according to Claim 10 wherein said at least one robot arms are opposed to provide symmetric painting of the object.

13. The apparatus according to Claim 10 wherein said frame rails are mounted on walls of a paint booth extending generally parallel to the path of movement.

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14. The apparatus according to Claim 10 wherein said frame rails are mounted on floor engaging legs.

15. The apparatus according to Claim 10 wherein said frame rails are tubular.

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16. The apparatus according to Claim 10 wherein frame rails are connected by at least one cross support member elevated above the plane of the upper surface of the object.

20           17. The apparatus according to Claim 16 wherein said frame rails and said at least one cross support member are tubular.

18. A modular apparatus for painting an object conveyed along a path comprising:

25           a pair of frame rails mounted on opposite sides of a path of conveyance of an object, said frame rails being elevated above a plane of an upper surface of the object;

at least one robot mounted on an associated one of each of said frame rails, each said at least one robot having four axes of movement and being movable along said associated frame rail; and

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a paint applicator mounted on each said at least one robot for painting surfaces of the object.

19. The apparatus according to Claim 18 wherein each said at least one robot has an articulated arm with said paint applicator attached to a free end thereof reaching substantially all external surfaces on a facing side of the object.

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20. The apparatus according to Claim 18 wherein frame rails are mounted on side walls of a painting booth, said side walls extending parallel to the path of movement.

21. The apparatus according to Claim 18 wherein frame rails are mounted on legs  
10 engaging a floor of a painting booth and are connected by at least one cross support member elevated above the plane of the upper surface of the object to form a rigid frame structure.

22. The apparatus according to Claim 21 wherein each said at least one robot  
15 includes a process controller mounted for movement therewith along said associated frame rail.

23. The apparatus according to Claim 22 wherein said at least one cross support member is hollow for receiving cables and conduits connecting said process controllers  
20 together.

24. The apparatus according to Claim 22 wherein said at least one cross support member is tubular and purged with an inert gas or air for explosion protection.

25. An apparatus for processing an object moving along a path comprising:  
25 at least one frame rail mounted to extend along a side of a path of movement of object, said at least one frame rail being elevated above a plane of an upper surface of the object;  
at least one mounting base attached to and movable along said at least one frame  
30 rail;

at least one robot arm mounted on said at least one mounting base, said at least one robot arm having four axes of movement relative to said mounting base; and

5 a tool mounted at a free end of said at least one robot arm for performing a process on the object.

26. The apparatus according to Claim 25 wherein said four axes of movement include two primary axes of operation defining a planar operating space for said tool transverse to the path of movement of the object.

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27. The apparatus according to Claim 25 wherein said arm includes a wrist mounting said tool and said four axes of movement include a wrist rotating axis and a wrist tilting axis for moving said tool.

15 28. The apparatus according to Claim 25 wherein said at least one frame rail is tubular.

29. The apparatus according to Claim 28 including a coupling conduit attached to said at least one frame rail and communicating with an interior of said at least one frame  
20 rail.

30. The apparatus according to Claim 25 wherein said at least one robot arm includes a process controller mounted for movement therewith along said at least one frame rail.